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CLASS 703, DATA PROCESSING: STRUCTURAL DESIGN, MODELING, SIMULATION, AND EMULATION

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SECTION I - CLASS DEFINITION

This class provides for electrical data processing apparatus and corresponding methods for the following subject matter:

- A. Processes or apparatus for sketching or outlining of layout of a physical object or part.
- B. Processes or apparatus for representing a physical process or system by mathematical expression.
- C. Processes or apparatus for modeling a physical system which includes devices for performing arithmetic and some limited logic operation upon an electrical signal, such as current or voltage, which is a continuously varying representation of physical quantity.
- D. Processes or apparatus for modeling to reproduce a nonelectrical device or system to predict its performance or to obtain a desired performance.
- E. Processes or apparatus for modeling and reproducing an electronic device or electrical system to predict its performance or to obtain a desired performance.
- F. Processes or apparatus that allows the data processing system to interpret and execute programs written for another kind of data processing system.

SCOPE OF THE CLASS

- (1) Note. This class is limited to electrical data processing apparatus and corresponding methods for structural design, modeling, simulation, and emulation.
- (2) Note. Claims directed to electrical digital logic circuitry or miscellaneous active electrical nonlinear devices and systems are classified elsewhere. See the SEE OR SEARCH CLASS notes below.
- (3) Note. Significantly claimed apparatus external to this class, claimed in combination with apparatus under the class definition, which perform structural design, modeling, simulation, or emulation data processing are classified in the class appropriate to the external device unless specifically excluded therefrom.
- (4) Note. Nominally claimed apparatus external to this class in combination with apparatus under the class definition is classified in this class unless provided for in the appropriate external class.

SECTION II - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 152.01 through 152.62 for borehole and drilling studying, in general.
- 222, Dispensing, subclasses 78 and 79 for firearm dispensing simulation.
- 324, Electricity: Measuring and Testing, subclasses 323 through 375 for investigating borehole fluid.
- 326, Electronic Digital Logic Circuitry, appropriate subclasses for the use of digital logic circuitry, in general.
- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for nonlinear solid-state analog circuits, in general.
- 340, Communications: Electrical, subclasses 853.1 through 856.4 for telemetering and monitoring a wellbore environment.

- 345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, subclasses 419 through 443 for graphical object display modeling using mathematical algorithm.
- 367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 73 for synthetic seismograms and models.
- 434, Education and Demonstration, subclasses 28 through 71, 219, 220, and 305 for vehicle related simulation for educational and demonstration purposes; subclasses 72 through 76, 78, and 79 for architectural design; subclass 126 for demonstration of fluid flow for educational purpose; subclass 218 for simulating nuclear energy for educational purposes; and other appropriate subclasses for simulating electrical systems for demonstration or educational purposes.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 266 through 274 for chemical process control or monitoring system, subclasses 281 through 285 for a computer controlling fluid level or flow, subclasses 286 through 298 for computer control in electrical power generation or distribution.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, appropriate subclasses for vehicle control and guidance, in general.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 6 through 9 for the application of a computer in well logging or borehole studying, subclasses 19 through 21 for biological and biochemical data processing analysis and measurement, subclasses 22 through 32 for chemical data processing analysis and measurement, subclasses 60 through 63 for electrical power parameter measurement, and subclasses 45 through 56 and 100 for fluid or fluid flow measurement.
- 708, Electrical Computers: Arithmetic Processing and Calculating, appropriate subclasses for arithmetic processing and calculating computer.
- 709, Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating, subclass 100 for virtual machine task and process management.
- 710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 8 through 14 for assigning operating characteristics to a peripheral device, subclasses 15 through 19 for detecting or observing operating characteristics or conditions of a peripheral device, and subclasses 62 through 74 for peripheral adapting, in general.
- 713, Electrical Computers and Digital Processing Systems: Support, subclass 500 for generation of clock, pulse, or timing signal or analysis.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 25 through 46 for locating fault in a computer system or processor, subclass 38 for locating fault in a computer program or software, and subclasses 724 through 745 for digital logic test event generating.
- 716, Data Processing: Design and Analysis of Circuit or Semiconductor Mask, subclass 6 for analyzing the timing delay of a circuit design.
- 717, Data Processing: Software Development, Installation, and Management, subclasses 131 through 133 for determining efficiency of program execution time analysis, subclasses 136 through 139 for program code translator, or subclasses 140 through 161 for compiler.

SUBCLASSES

1 STRUCTURAL DESIGN:

This subclass is indented under the class definition. Subject matter comprising means or steps for sketching or outlining of layout of a physical object or part.

(1) Note. Examples of such structural designs include space planning, interior design, and design of building truss, piping, or bridge.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for modeling of a physical system.
- 7, for mechanical design and simulation.
- 8, for vehicle design and simulation.

SEE OR SEARCH CLASS:

- 434, Education and Demonstration, subclasses 72 through 76, 78, and 79 for architectural design.

2 MODELING BY MATHEMATICAL EXPRESSION:

This subclass is indented under the class definition. Subject matter comprising means or steps for representing a physical process or system by mathematical expression.

SEE OR SEARCH CLASS:

- 345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, subclasses 419 and 420 for graphical object display modeling using mathematical algorithm.
- 434, Education and Demonstration, subclasses 277 through 282 for modeling crystal, molecular, or atom structure for demonstration and educational purposes.

3 **ELECTRICAL ANALOG SIMULATOR:**

This subclass is indented under the class definition. Subject matter comprising means or steps for modeling (i.e., artificially mimicking) a physical system which includes devices for performing arithmetic and some limited logic operation upon an electrical signal, such as current or voltage, which is a continuously varying representation of physical quantity and which is some function of quantities such as direct proportion, inverse proportion, or square law relationship.

SEE OR SEARCH CLASS:

- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, appropriate subclasses for nonlinear solid-state analog circuits, in general.
- 708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 800 through 854 for analog calculating computer.

4 **Of electrical device or system:**

This subclass is indented under subclass 3. Subject matter wherein the simulated system involves an electrical device or system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 13, for simulating a digital electronic device or system.

5 **Of physical phenomenon (e.g., heat, wave, geophysics):**

This subclass is indented under subclass 3. Subject matter wherein the simulated system involves a physical phenomenon.

SEE OR SEARCH CLASS:

- 367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 73 for synthetic seismograms and models.

6 **SIMULATING NONELECTRICAL DEVICE OR SYSTEM:**

This subclass is indented under the class definition. Subject matter comprising means or steps for modeling (i.e., artificially mimicking) to reproduce a nonelectrical device or system to predict its performance or to obtain a desired performance.

(1) Note. Examples of simulation of such nonelectrical device or system includes tire tread noise, fog effect, physical process, process time for manufacturing metal die, evaluating human performance, or colored fabric or textile.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3, for analog simulator of nonelectrical device or system.

7 **Mechanical:**

This subclass is indented under subclass 6. Subject matter wherein the nonelectrical system is a mechanical system.

SEE OR SEARCH CLASS:

- 222, Dispensing, subclasses 78 and 79 for dispensing simulation (e.g., firearms).

8 **Vehicle:**

This subclass is indented under subclass 7. Subject matter wherein the simulated mechanical system involves a

vehicle or part thereof.

(1) Note. The term "vehicle" herein encompasses, for example, automobile, aircraft, spacecraft, train, etc.

SEE OR SEARCH CLASS:

- 434, Education and Demonstration, subclasses 28 through 71, 219, 220, and 305 for vehicle related simulation for educational and demonstration purposes.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, appropriate subclasses for vehicle control and guidance, in general.

9 **Fluid:**

This subclass is indented under subclass 6. Subject matter wherein the simulated system involves a liquid or gas flow phenomenon.

SEE OR SEARCH CLASS:

- 434, Education and Demonstration, subclass 126 for demonstration of fluid flow for educational purposes.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 281 through 285 for a computer controlling fluid level or flow.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 45 through 56 and 100 for fluid or fluid flow measurement.

10 **Well or reservoir:**

This subclass is indented under subclass 9. Subject matter wherein the fluid phenomenon simulated is that of a well or reservoir.

(1) Note. Included herein are subject matter directed to simulating boreholes and devices for pumping the fluid from a well.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 152.01 through 152.62 for borehole and drilling studying, in general.
- 324, Electricity: Measuring and Testing, subclasses 323 through 375 for investigating borehole fluid.
- 340, Communications: Electrical, subclasses 853.1 through 856.4 for telemetering and monitoring a wellbore environment.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 6 through 13 for the application of a computer in well logging or borehole studying.

11 **Biological or biochemical:**

This subclass is indented under subclass 6. Subject matter wherein the simulated system is a biological or biochemical system.

SEE OR SEARCH CLASS:

- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 266 through 274 for chemical process control or monitoring system.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 19 through 21 for biological or biochemical data processing analysis and measurement.

12 **Chemical:**

This subclass is indented under subclass 6. Subject matter wherein the simulated system is a chemical system.

SEE OR SEARCH CLASS:

- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 266 through 274 for chemical process control or monitoring system.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 22 through 32 for chemical data processing analysis and measurement.

13 **SIMULATING ELECTRONIC DEVICE OR ELECTRICAL SYSTEM:**

This subclass is indented under the class definition. Subject matter comprising means or steps for modeling (i.e., artificially mimicking) and reproducing an electronic device or electrical system to predict its performance or to obtain a desired performance.

SEE OR SEARCH THIS CLASS, SUBCLASS:

4, for simulation of an analog electrical device or system.

SEE OR SEARCH CLASS:

434, Education and Demonstration, appropriate subclasses for simulating electrical systems for demonstration or educational purposes.

14 Circuit simulation:

This subclass is indented under subclass 13. Subject matter comprising means or steps for modeling and reproducing an electrical or electronic circuit operation so as to predict or analyze its behavior.

15 Including logic:

This subclass is indented under subclass 14. Subject matter wherein the simulated circuit consists of logic circuit.

SEE OR SEARCH CLASS:

326, Electronic Digital Logic Circuitry, appropriate subclasses for the use of digital logic circuitry, in general.

16 Event-driven:

This subclass is indented under subclass 15. Subject matter wherein the process of simulating a logic circuit is driven by a predicated circumstance or occurrence.

(1) Note. The event-driven subject matter of this subclass is at the logic circuit level. However, for the event-driven simulation at the higher level, that is, system level, see the SEE OR SEARCH THIS CLASS, SUBCLASS notes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

17, for simulating an electronic device or system based on the occurrence of a specified event.

17 Event-driven:

This subclass is indented under subclass 13. Subject matter wherein the process of simulating an electronic device or electrical system is driven by a predicated circumstance or occurrence.

(1) Note. The event-driven simulation of this subclass is at a higher level, that is, system level. However, for event-driven simulation at the logic level, see the SEE OR SEARCH THIS CLASS, SUBCLASS notes below.

SEE OR SEARCH THIS CLASS, SUBCLASS:

16, for logic event-driven circuit simulation.

SEE OR SEARCH CLASS:

714, Error Detection/Correction and Fault Detection/Recovery, subclasses 724 through 745 for digital logic test event generating.

18 Power system:

This subclass is indented under subclass 13. Subject matter wherein the electrical system is a power system or a powerplant.

SEE OR SEARCH CLASS:

434, Education and Demonstration, subclass 218 for simulating nuclear energy for educational purposes.

- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 286 through 298 for the application of a computer in electrical power generation or distribution.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 60 through 63 for electrical power parameter measurement.

19 **Timing:**

This subclass is indented under subclass 13. Subject matter wherein the timing delay of the electrical device or the electrical system is being simulated.

SEE OR SEARCH CLASS:

- 713, Electrical Computers and Digital Processing Systems: Support, subclasses 500+ through 501 for generation of clock, pulse, or timing signal or analysis.
- 716, Data Processing: Design and Analysis of Circuit or Semiconductor Mask, subclass 6 for analyzing the timing delay of a circuit design.

20 **Target device:**

This subclass is indented under subclass 13. Subject matter comprising means or steps for imitating the existing hardware or software of a first processing unit to run software applications on a second processing unit having a second dissimilar processor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 21, for simulation of a computer or a peripheral device.

SEE OR SEARCH CLASS:

- 709, Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating, subclass 100 for virtual machine task and process management.

21 **Computer or peripheral device:**

This subclass is indented under subclass 13. Subject matter comprising means or steps to model (i.e., artificially mimic) the performance of a computer or a peripheral device.

SEE OR SEARCH CLASS:

- 710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 8 through 14 for assigning operating characteristics to a peripheral device and subclasses 15 through 19 for detecting or observing operating characteristics or conditions of a peripheral device.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 25 through 46 for locating fault in a computer system or processor.

22 **Software program (i.e., performance prediction):**

This subclass is indented under subclass 13. Subject matter comprising means or steps to model (i.e., artificially mimic) a computer software program so as to predict or analyze its performance.

SEE OR SEARCH CLASS:

- 714, Error Detection/Correction and Fault Detection/Recovery, subclass 38 for locating fault in a computer program or software.
- 717, Data Processing: Software Development, Installation, and Management, subclasses 131 through 133 for determining efficiency of program execution time analysis.

23 **EMULATION:**

This subclass is indented under the class definition. Subject matter comprising means or steps that allow the data processing system to interpret and execute programs written for another kind of data processing system.

SEE OR SEARCH CLASS:

- 709, Electrical Computers and Digital Processing Systems: Multiple Computer or Process Coordinating,

subclass 1 for virtual machine task and process management.

717, Data Processing: Software Development, Installation, and Management, subclasses 136 through 161 for program code translator or compiler.

24 Of peripheral device:

This subclass is indented under subclass 23. Subject matter comprising means or steps for emulating a computer peripheral device.

SEE OR SEARCH CLASS:

710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 62 through 74 for peripheral adapting, in general.

25 I/O adapter (e.g., port, controller):

This subclass is indented under subclass 24. Subject matter comprising means or steps for emulating an I/O port or controller.

26 Of instruction:

This subclass is indented under subclass 23. Subject matter comprising means or steps for emulating operation of a first system (e.g., source CPU) by translating first system (source CPU) instructions into second system (e.g., target CPU) instructions for issue and execution by a second system (target CPU).

SEE OR SEARCH CLASS:

717, Data Processing: Software Development, Installation, and Management, subclasses 136 through 161 for program code translator or compiler.

27 Compatibility emulation:

This subclass is indented under subclass 23. Subject matter comprising means or steps for emulating operation of a first data processing system to handle both data and programs devised for some other type of computer system.

28 In-circuit emulator (i.e., ICE):

This subclass is indented under subclass 23. Subject matter comprising means or steps for debugging, verifying, and developing the hardware and software of a target data processing system in a source data processing system.

SEE OR SEARCH CLASS:

717, Data Processing: Software Development, Installation, and Management, subclasses 127 through 129 for program code execution analyzer, debugger, or monitor.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 488 DESIGN AND ANALYSIS (364/488):

Foreign art collection for subject matter comprising means or steps for designing and analyzing electrical components and circuits made up thereof.

FOR 500 COMPATIBILITY, SIMULATION, OR EMULATION OF SYSTEM COMPONENTS (395/500):

Foreign art collection for subject matter including means or steps by which a digital data processing system, memory, or peripheral is made compatible with or caused to emulate or simulate another digital data processing system, memory, or peripheral.

FOR 512 STRUCTURAL DESIGN (364/512):

Foreign art collection for subject matter comprising means or steps for sketching or outlining of layout of a physical object or part.

FOR 578 SIMULATION (364/578):

Foreign art collection for subject matter wherein a system or process is represented by an electrical model of the system or process.

- FOR 801 **SIMULATOR (364/801):**
Foreign art collection for subject matter wherein the computer is utilized as a model of some physical or physiological system.
- FOR 802 **Of electrical phenomenon, device, or system (364/802):**
Foreign art collection for subject matter wherein the simulated system involves an electrical phenomenon, device, or system.
- FOR 803 **Of fluid phenomenon, device, or system (364/803):**
Foreign art collection for subject matter wherein the simulated system involves a fluid phenomenon, device, or system.
- FOR 804 **Well (364/804):**
Foreign art collection for subject matter wherein the fluid phenomenon simulated is that of a well.
- FOR 805 **Of vehicle, part thereof, or traffic (364/805):**
Foreign art collection for subject matter wherein the simulated system involves a vehicle, part thereof, or traffic.
- FOR 806 **Of physical phenomenon (e.g., nuclear, heat, wave, geophysics) (364/806):**
Foreign art collection for subject matter wherein the simulated system involves a physical phenomenon.
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Last modified 05/14/2003 16:00:19

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